

RESEARCH PROBLEM STATEMENT

Problem Title: Design Methods for Unique Culvert Installations

No.: 05.04-6

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1. Briefly describe the problem to be addressed:

Current Highway Culvert design practice is based upon the Federal Highway Administrations Design Manual, HDS-5. The HDS-5 manual is now over 30 years old and coefficients adopted for use were based on limited small model tests and did not address the design issues of important non-traditional Culvert installations such as "Fish Friendly" design. A great deal of significant research has been done in the last 30 years on Culvert performance, including full scale and large scale modeling of both traditional and non-traditional Culverts which is not captured by either HDS-5 or the FHWA Culvert computer model, HY8. HY8, because it was also developed 30 years ago and still relies on DOS computational algorithms, is extremely difficult to apply. Similarly it simply incorporated the now obsolete design methodologies and standards from HDS-5 into the computer model. Many State Departments of Transportation including UDOT lack user friendly and accurate software tools for the design of non-traditional and traditional Culvert installations. There is a need for the development of a design methodology that conforms to FHWA standards and which also incorporates the latest information and research results. The methodology should be complementary with the WMS watershed software that is currently being used by UDOT and several other DOTs.

2. List the research objective(s) to be accomplished:

1. Literature review on design criteria for non-traditional culvert installations including research work currently underway at the Utah Water Research Laboratory.
2. Development of a computer based tool that incorporates current FHWA design standards and extends the scope to include the non-traditional installations.
3. Software, final report and training seminar.

3. List the major tasks required to accomplish the research objective(s):

Estimated person-hours

1. Conduct the literature review and summarize the results (2 wks professional, 4 wks student)
2. Develop a prototype computer program that incorporates current FHWA design standards and also criteria for non-traditional culverts. Present the prototype to the TAC committee for approval (4 wks professional, 24 wks students)
3. Develop the final software deliverable. (2 wks professional, 24 wks students)
4. Develop the final report including discussion on the models complementary use with WMS. (1 wk professional, 3 wks students)
5. Prepare and present a training seminar (1 wk professional, 1 wk students)

4. Outline the proposed schedule (when do you need this done, and how we will get there):

July – Sept 2005 Literature review

Sept – Dec 2005 Prototype development and TAC approval

Jan – April 2005 Final design and development

April – June 2005 Final Report and Seminar

5. Indicate type of research and / or development project this is:

Large: ☒ Research Project ☐ Development Project

Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative :

☐ Other _____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

University

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

- A. Practical design software
- B. Final Report and user guide
- C. Training Seminar

8. Describe how will this project be implemented at UDOT.

The computer based design tool will be distributed royalty free to UDOT

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

Improved efficiency and economy for culvert design for both traditional and non-traditional culvert installations

10. Describe the expected risks, obstacles, and strategies to overcome these.

None anticipated.

11. List the key UDOT Champion of this project (person who will help Research steer and lead this project, and will participate in implementation of the results):

Denis Stuhff of UDOT Central Hydraulics

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): \$35,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone	Attended UTRAC?
A)	Michael Fazio of UDOT Central Hydraulics		X
B)	Tim Ullarich of UDOT Central Hydraulics		X
C)	Jerry Chaney of UDOT Environmental Division		X
D)	Marco Palacios UDOT Hydraulic Engineer Region 3		X
E)			
F)			
G)			

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

FHWA and other state DOTs